*Preparing for Class 7*

Reading: Section 1.3, pp. 20-21. Also read Section 10.3.

*Notation and Terminology:* $dy/dx$ stands for $y'(x)$. We have referred to this as a *rate of change*, but it is also referred to as a *derivative*. Similarly, an equation involving derivatives is often referred to as a *differential equation* rather than a rate equation.

Problems: Section 1.3, #18, 19, 23, 32. Also do Section 10.3, #9a)b)c)

**Homework Due:** All problems assigned to prepare for Classes 6 and 7 are due at the start of Class 7.

**Gateways:** If you did not pass the Gateway test given in class last week, you should make plans to attend the Gateway workshops for tutoring and retesting.

**Monday, September**

*Class 7:*

**Slope Fields and Euler's Method**

To construct a *slope field* for a rate equation of the form $y'(t) = F(t, y(t))$, here's what you do: Draw a pair of coordinate axes. Pick a point on the plane with coordinates $(t, y)$. At the point, draw a little line segment whose slope is $y'(t)$, calculated from the rate equation using the values $t$ and $y$. Repeat this process at many other points, creating a "field" of little slopes. The slope field can help you visualize the information provided by a rate equation. It can also help you better understand how Euler's Method produces an approximate solution to the rate equation.

*Preparing for Class 8*

Reading: Section 10.2, and Section 10.3 again

Problems: Section 10.2, #3, 4, 5

**Wednesday, September**

*Class 8:*

**Newton's Law of Cooling Revisited: Refining the Model**

Your work with last week's lab showed that Newton's Law of Cooling did a good job of explaining the initial decrease in temperature in our experiment but predicted a more rapid rate of subsequent cooling than we actually observed. In today's class we will look more closely at the experiment, producing a model with *two* rate equations that should better account for the observed behavior. You will also see how Euler's Method can be applied to such a model.

**Take-Home Quiz on Euler's Method Handed Out.**

Section 1.1 of *Calculus in Context* handed out.

**Lab 3: Euler's Method and More Complex Models**

So far we have been exposed to models which consist of a single rate equation and an associated initial condition. Taken together, the rate equation and initial value are called an initial value problem (often abbreviated as "IVP"). We also know that Euler's Method can be used to find approximate solutions to these IVPs. It is also possible to have models with *more than one* rate equation and associated initial condition. In this week's lab we will consider more complex models and see how Euler's method can be adapted to find approximate solutions for these models.

*Preparing for Class 9*

Reading: *CiC Handouts* , Section 1.1

Problems: Section 10.2, #7; Section 10.3, #6, *CiC Handouts* Section 1.1, #1-5.

**Friday, September**

*Class 9:*

**The S-I-R Model of a Measles Epidemic**

Measles is a disease which confers immunity on someone who recovers from the disease. Excluding the possibility of dying from it, this divides a population into three groups: those who have never had measles, and hence are *susceptible* to it, those who are currently *infected* with the disease, and those who have *recovered* from it. In today's class we will use thought experiments to construct a model of *three* rate equations of a population experiencing a measles outbreak. You will also see how to apply Euler's Method to find approximate solutions to this model.

**Take-Home Quiz on Euler's Method Due at the Start of Class.**